emptying in relation to this procedure and there is little information on its long-term effect on gastric motility. Buckler[1] observed delayed gastric emptying, whereas Madsen and Pedersen[4], George, Connell and Kennedy[2] and McKelvey[5] observed rapid gastric emptying, after vagotomy and pyloroplasty.

Using a standard meal I have studied the pattern and rate of gastrci emptying before and after vagotomy and pyloroplasty.

Method. The method consisted of scanning the upper abdomen at intervals after the ingestion of a meal labelled with radioactive chromium[3]. A disappearance curve of the chromium from the stomach was obtained and from this the rate of emptying, expressed as half-life ($T\frac{1}{2}$) in minutes, of the meal from the stomach was calculated. The percentage of the meal which had left the stomach by the time of the first scan was also measured. This was called the initial fraction.

Results. Sixteen patients were studied before and after surgery. There was no great change in the $T\frac{1}{2}$. The mean value pre-operatively was 63.5 minutes, S.D. $\pm$ 14.8, compared with 55.7 minutes, S.D. $\pm$ 23.7, post-operatively. There was a highly significant increase in the initial fraction ($p<0.001$) post-operatively compared with pre-operatively, the mean values being respectively 39.3%, S.D. $\pm$ 16.1, and 12.5%, S.D. $\pm$ 13.6.

Seven of the 16 patients experienced diarrhoea at some stage post-operatively. There was a tendency for the initial fraction to be greater and for the $T\frac{1}{2}$ to be lower in these patients than in those who had had no diarrhoea. This did not reach statistical significance.

The effect of eating the meal whilst lying on the left side and of remaining in this position between observations was studied in 11 patients who had undergone vagotomy and pyloroplasty. There was a significant decrease in the initial fraction and increase in the $T\frac{1}{2}$ compared with results obtained with normal posture. Alteration of posture had no effect on emptying in four control subjects.

Conclusion. The conclusion is that vagotomy and pyloroplasty alters the pattern rather than the rate of gastric emptying. There is a rapid initial dump of part of the meal from the stomach following operation. The explanation of this is not clear, but these findings merit further study particularly in relation to troublesome post-operative sequelae.

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THE McFARLAND BY-PASS PROCEDURE IN INFANTILE PSEUDARTHROSIS OF THE TIBIA

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Pseudarthrosis of the tibia is a rare pathological fracture followed by non-union. This study is confined to the use of the By-Pass Graft in

established pseudarthrosis as first reported by B. L. McFarland in *British Journal of Surgery* in 1940.

The records of the Royal Liverpool Children's Hospital showed that McFarland operated upon 14 cases between 1936 and 1961. It has been possible to trace 11 of these cases, 5 of which have been examined, 10 have been photographed and radiographs have been obtained of all.

None of these cases has subsequently been amputated and the follow-up ranges from 34 years to 9 years with an average of 19 years.

The final shape of the leg appears to depend upon the basic pathology; it is good in pseudarthrosis following osteotomy of the congenitally bowed tibia, but is only fair in neurofibromatosis and fibrous dysplasia.

Primary failure of the graft may follow infection or slipping of the graft. In this latter context McFarland stressed that operation should not be performed before the age of 3 years as plaster fixation was difficult in the small limbs of the younger child. Late failure may occur and it is seen where the ' by-pass ' does not lie in the true long axis of the limb.

In the by-pass graft, McFarland abandoned the classical principle of bone grafting, i.e. to immobilize the fracture by mechanical means combined with the application of the graft directly to the site of the non-union. In this method the fracture is immobilized only insofar as it is exposed to longitudinal compression forces as a result of being sprung into position on the concave side of the pseudarthrosis.

Massive cancellous grafts with intact blood vessels may be a superior form of transplant to the small chips of bone used in the classical Phemister technique. Ray and Halloway have shown that blood supply in foetal bones can be restored relatively suddenly—that is, once the blood vessels of the host anastomose with those of the transplant, the circulation is rapidly restored. It would appear that, under ideal circumstances, the incorporation of a bone transplant is not only by the classical ' creeping substitution ' described by Phemister but may occur by a direct anastomosis of host and transplant vessels. Another important argument in favour of using relatively large pieces of bone as transplants comes from the work of Bassett (1966), who has shown that bone which is stressed develops electrical potentials and conversely the passage of an electric current stimulates bone formation. He suggests that the collagen apatite crystal complex is a source of these piezo-electric effects and that mechanical integrity of bone is important if these effects are to be brought into action and that this is the mechanism by which bone reacts to external forces and hypertrophies with use.

Length of the leg. The shortening of the limb varied between a minimum of $\frac{3}{4}$ in. to $3\frac{1}{2}$ in. maximum. The loss of length is proportional to the number of operations performed before union is obtained, and the patient with $3\frac{1}{2}$ in. shortening had already had five simple grafting operations prior to the successful by-pass graft in 1936.

The McFarland By-Pass Graft can give satisfactory results in all types of infantile tibial pseudarthrosis if performed after the age of 3 years and if the aforementioned technical details are observed.

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II. SURGERY OF TRAUMA (PART I)—TRAUMA TO THE TRUNK

TOTAL MANAGEMENT OF TRAUMA

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THE TOTAL MANAGEMENT of trauma can be looked upon as the antithesis of its partial management. It requires that seriously injured persons, in particular, should be assured of being taken without delay to centres that can fully, and on arrival, meet their diagnostic and therapeutic needs. In those cases in which delay is likely, the accident service concerned should be able to arrange for suitably skilled care to be taken to the patient, whether at the site of an accident or in a small outlying hospital.

The accident service of a large hospital should be regarded as a service in its own right. It should have its own department for reception, resuscitation and further intensive care and its own emergency operating facilities. It should be able to call upon these by right, at any time of day or night, and when necessary over-ride less urgent surgical activities.

Whatever skilled help is provided from the special departments of a general hospital, an accident service requires its own core of staff whose duties are largely if not entirely within the accident service. Among them anaesthetists, accident surgeons and nurses are of outstanding importance and it is they who should provide the basis of interest, availability and goodwill upon which a good accident service depends. Future provision of proper care will be facilitated if accident services are recognized as providing for nurses as well as for doctors a sound basic training in much more than the care of the injured.

The ease with which such recommendations have been made over the years has been well matched by the readiness with which they have been disregarded. It is acknowledged that in many cases the reorganization necessary to care promptly and properly for injured persons will disturb existing arrangements to an extent that is unacceptable: where this is so, the victims of accidents can expect only partial management.

CHEST INJURIES : DIAGNOSIS AND GENERAL CONSIDERATIONS

B. J. Bickford (Liverpool)

SEVERE INJURIES TO the chest are frequently accompanied by injuries to the head, limbs and abdomen. Hypoxia and hypotension demand urgent endotracheal intubation, ventilation and blood transfusion.